



PERSONAL AGENT SYSTEM-

[0001] Background of the Invention

[0002] 1. Field of the Invention

5 [0003] The invention relates to a personal agent system within a computer system.

[0004] In addition, the invention relates to a method for providing a personal agent system within a computer system.

10 [0005] 2. Description of the Prior Art

[0006] Such systems and methods are generally known. An example thereof is Microsoft's Firefly system. In ~~said~~ that system, a user may have an agent - arranged as a computer program within a computer network - carry out an order to compose a list having musical compact discs which are interesting to the user. The agent is arranged to carry out ~~said~~ the task autonomously, the agent being capable of shifting within the computer network and making contact with other agents who are active within the system. From the contact with other agents, inter alia, the agent may obtain information to complete ~~his~~ its task.

25 [0007] WO9625012 discloses an information service provision system for making services available by means of one or more communication networks. The system makes use of intelligent software agents in a distributed processing environment (DPE). The agents co-operate to provide access

for system users to the services. The agents are reconfigurable to modify functionality of the system available to the user: the agent reconfigures itself in response to a user input to the system, and modifies ~~said~~ functionallity the functionality accordingly. The goal of the prior-art disclosure is advanced multimedia transmission over telecommunication networks, to be controlled by users, via ~~said the~~ reconfigurable agents, executing the user's commands.

[0008] The goal of our invention, on the contrary, is to lower the heavy burden of computer networks, caused by conventional "stand alone" agents used in state-of-the-art agent systems, each of ~~said those~~ agents being rather extensive and complex computer programs, required to be able to carry out their task, to move through the computer network and to make contact with other agents all of those agents maintaining an extensive mutual communication.

~~Moreover, due to the independency of all those individual ("stand alone") agents, it is hardly feasible to control all contacts made by those agents with third parties. A supplementary goal of the invention is to provide a system with advanced control of all software agents. To this end, the system according to the invention comprises a personal WO9625012 discloses an information service provision system for making services available by means of one or more communication networks. The system makes use of intelligent software agents in a distributed processing environment (DPE). The agents co operate to provide access for system users to the services. The agents are reconfigurable to modify functionality of the system available to the user: the agent reconfigures itself in response to a user input to~~

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[0009] Moreover, due to the independency of all those
 15 individual ("stand alone") agents, it is hardly feasible to
 control all contacts made by those agents with third
 parties. A supplementary goal of the invention is to provide
 a system with advanced control of all software agents.

20 [0010] Summary of the Invention

[0011] To overcome these and other drawbacks of the prior
art, the system according to the invention comprises a
personal To this end, the system according to the invention
 25 ~~comprises a personal~~ agent sub-system comprising a plurality
 of personal agents, each personal agent being arranged to
~~communicate with~~ perform tasks for only one single user.
 Moreover the system according to the invention comprises at
 least one service agent sub-system, comprising a plurality
 30 of personal service agents, each personal service agent
 being arranged for carrying out a specific sub-task for the
 user, and each personal service agent being connected to one

of ~~said the~~ personal agents. Finally, the system according to the invention comprises a ~~processing sub-system, comprising at least one processor for processing data of said service agents~~ coordinating sub-system, comprising one
 5 or more coordination processors for mutual coordination of actions of the personal service agents of different users.

[0012] ~~Simply said, the invention~~ In this way, the inventive system provides for a regular and efficient
 10 architecture offering a much better controllability of the agents. Each user only communicates directly with his/her personal agent, which subsequently passes on orders from the user to the relevant service agent and vice versa. In
 15 addition, problems regarding unreliable third parties are avoided since the personal agent and the (personal) service agents of a user exclusively operate for their own user. Since interaction with agents of third parties does not take place directly, but by way of a neutral processor, it is avoided that confidential information is inadvertently
 20 exchanged.

[0013] ~~By self-learning agents with respect to the user behaviour, preferences etc., the personal agent will minimize interaction with the user, hence the interactions with the user are minimized,~~
 25 resulting in a reduction of system load. Moreover, an additional effect is that the quality of the service to the user will increase in course of time.

30 [0014] Brief Description of the Drawings

[0015] The invention will be further clarified in the following description of an exemplary embodiment of the invention, with reference to the ~~drawing~~ drawings enclosed.

5 [0016] ~~The single figure~~ FIG. 1 schematically shows an example of a system according to the invention.

[0017] FIG. 2 depicts a networked environment in which the inventive system can be used.

10 [0018] Detailed Description

[0019] ~~The figure~~ FIG. 1 shows a personal agent system 1 according to the invention. System 1 is provided with a
15 receptor section 2 for setting up a communicative connection with users, a central control unit 6 for distributing information flows, and an environment 10 of personal agents, two environments 20, 30 having personal service agents, and an environment 40 for processing parts.

20 [0020] The personal agent environment 10 of the system 1 in this example is provided with four personal agents 11, 12, 13 and 14. Each personal agent is allotted to a single user who may set up a connection exclusively with his own
25 personal agent.

[0021] For a user, his own personal agent is the only means by which he may ~~utilise~~ utilize the system 1. The personal agents are therefore arranged to communicate with
30 their own respective users~~user~~, e.g., to receive orders or to pass on information obtained to the ~~user~~ users. In addition, the personal agent is arranged for communication

with personal service agents to be discussed below, e.g., for passing on orders to, or receiving results from, the personal service agents.

5 [0022] In this example, there are two personal service-agent environments present, arranged as a secretary environment 20 having personal secretary agents in the form of secretaries 21, 22, 23 and, as a personal travelling-agent environment having travelling agents 31, 32 and 34.
10 Personal service agents, such as the travelling agents and secretaries referred to above, operate exclusively for a single user. To achieve this, the personal service agents are connected to the personal agent of their own user. Having said this, the invention is not limited to
15 application with two service-agent environments; any number of service-agent environments may be chosen.

[0023] The processing-part environment 40 is provided with a processing part in the form of an appointment
20 maker 41. ~~Said~~ The appointment maker 41 is arranged for processing, based on data as supplied by a service agent such as, e.g., a secretary and, if necessary, making contact with other service agents. In this connection, the data of the service agents is treated confidentially. The
25 appointment maker 41 is referred to by way of example of a processing part, and the invention is also applicable with other processing parts.

[0024] A user is always provided with a personal agent,
30 since the communication with the personal agent system takes place by way of the personal agent. In addition, each user is provided with at least a personal service agent, but the

user does have the choice of the service agent he prefers to use. Since the user chooses the functions required by him, there occur no unused elements in the system. As a result, the system is kept as small as possible, and therefore operates efficiently.

[0025] The personal agent 11 disposes of two personal service agents, i.e., a secretary 21 and a travelling agent 31. The secretary 21 is implemented in the form of an independently operating program which is especially arranged for carrying out specific tasks, in this case carrying out secretarial tasks such as, e.g., managing the agenda of the user and making appointments with third parties. The travelling agent 31 is also implemented in the form of an independently operating program which is especially arranged for carrying out specific tasks, in this case, by way of example, planning a travelling schedule.

[0026] Since the user is permitted to choose which tasks he wants to have the personal agent system carry out, not all possible service agents need be allotted to a personal agent. Thus, the personal agent 13 is only provided with a secretary 23, and the personal agent 14 is only provided with a travelling agent 34.

[0027] Because in the system according to the invention, the agents and agents are capable only of communicating with predetermined parties according to fixed rules, therewith determining a social hierarchy, the reliability of the system is guaranteed. Because the hierarchy also prevents unnecessary communication, the burden on the system is

reduced. Therewith, a personal agent system is obtained which is reliable, purposeful and efficient to users.

[0028] System 1 is implemented in the form of a computer system, including a computer network. The environments 10, 20, 30 and 40 may each wholly or partly consist of physical and logical environments. In this connection, a physical environment is determined by a single computer, and a logical environment may comprise several computers, the boundaries of the environment being determined by participants' data, such as, e.g., an address list which may be stored in, e.g., the central control unit 6. In that regard, FIG. 2 schematically depicts a networked environment in which the present invention can be used. As shown, this environment contains computers 60', formed of illustratively individual personal computers 60₁', 60₂', ..., 60_n' (each being substantially the same as PC 60 shown in FIG. 1), all connected through computer network 70 to personal agent system 1. Here, a user of any of the personal computers 60' can interact with inventive system 1 through network 70. Network 70 can be any kind of network. Any number of users of personal computers 60' can interact with system 1.

[0029] The communication takes place by way of communicative connections comprising all options for transferring data, both unidirectional and bidirectional connections, as well as permanent and temporary connections. In particular, there is deemed to be included exchange of data within networks, such as intranet, Internet, and the protocols required for the exchange of data within a computer network, and in particular relating to agent software.

[0030] In this embodiment and returning to FIG. 1, system 1 is arranged, by way of example, for four users. The invention may, however, be applied to other numbers of users. In this example, the users may make contact, by way of a personal computer (PC) 60, with a modem by way of a telephone line, with the receptor section 2. By way of a user interface of the personal computer 60, the users may pass on information to, and receive it from, system 1. The way of interaction, which is referred to here, of the user with the system 1 by way of the receptor section 2, is referred to here exclusively by way of example; the invention is also applicable with other ways of communication capable of being applied between a user and a computer system. Such ways are known, so that for briefness' sake there is refrained from a detailed description.

[0031] The personal agents 11, 12, 13 and 14, as well as the service agents 21, 22, 23, 31, 32 and 34 are implemented as independently operating programs such as, e.g., an agent. Such programs are generally known, so that for briefness' sake there is refrained from a detailed description.

[0032] In operation, a first user makes contact, by way of a personal computer 60, with the receptor section 2 of the system 1. The receptor section 2 provides a communication channel to the central control unit 6 which, based on the identity of the first user, locates its associated personal agent 11, and sets up a connection. In this example, the central control unit 6 is implemented with an address book with location data of all parts of the

system 1. The various parts of the system are capable of obtaining, at the central control unit 6, the data required for making contact with another part. Based on the data present within the central control unit 6, it may decide whether or not to provide information to a part in question; as a result, the central control unit 6 protects the hierarchy within system 1. Therewith, it is also achieved that confidential data is not supplied to unreliable parties.

[0033] An example of a service to be rendered by the personal agent system according to the invention is making appointments.

[0034] A first user then passes on to his agent 11 that he wants to make an appointment with, e.g., a second and a third user on a point in time X and a location Z.

[0035] The agent 11 passes on the information relating to the appointment to the secretary 21, who is also associated with the first user. The secretary 21 ~~analyses~~ analyzes the information and makes contact with a processing unit 41 operating as an appointment maker, with the instruction of making an appointment for the first, second and third users at the point in time between X and Y and location Z. The appointment maker 41 then makes contact with the secretaries 22 and 23 of the second and third users, respectively. ~~Said s~~ Secretaries 22 and 23 check whether the appointment in question is permitted to take place, based on the agenda of their ~~user~~ respective users. Both secretaries 22 and 23 pass on their wishes relating to the time and place to the appointment maker 41, who

subsequently, based on the wishes of all secretaries involved, determines the optimum appointment. In this connection, the location and time offering the best solution for all users are sought. For all those involved, the most acceptable point in time proves to be X' and for the location Z'. Having said this, in another modification of the embodiment processing parts may also be subject to other criteria in processing data from service agents. In the present example, the wishes of a specific user might prevail over those of other users, e.g., since ~~said-that~~ user is available only at, e.g., a specific number of points in time, or is bound to a specific location.

[0036] The appointment maker 41 passes on the information on the appointment determined by him on point in time X' and location Z' to the secretaries 21, 22 and 23, who note the appointment in the agenda of the ~~user~~ users in question and notify the associated ~~agent~~ agents 11, 12 and 13 of the appointment. When their ~~user~~ respective users makes contact again, the agents 11, 12 and 13 will notify ~~the user~~ those users of the appointment.

[0037] The agent 11, which has been notified of the information of the appointment in the meantime, now notifies the travelling agent 31 associated with it of the appointment with the instruction of drawing up a travelling schedule with which the user will arrive at the appointed location at the appointed time. The travelling agent 31 then draws up the required travelling schedule and passes it on to the agent 11, who will pass on ~~said-that~~ schedule at a next contact with the user. In a modification of the embodiment of the invention, the personal service agents of

a user may directly exchange specified information, apart from the option referred to above of exchanging information by way of the personal agent. In this connection, the service agents must be aware of each other's existence and options. A secretary of the travelling agent of a user might hear, e.g., what the travelling time between two locations amounts to, in order to be capable, e.g., of better managing the agenda of the user in this way. Since both personal service agents operate exclusively for the same user, problems relating to confidential data are avoided. Due to ~~said~~ the direct communication between the service agents, the burden on the system is reduced.

[0038] Although in this example there was assumed a central control unit 6, provided with an address book for regulating the social hierarchy within the system, other embodiments of such a control system are also applicable, such as, e.g., identification of agents by way of a password or key. There may also be applied a bulletin-board system.

[0039] In a modification of the embodiment of the invention, the personal agents are provided with a self-learning module which is arranged to learn from the interaction with the user and to adjust the behaviour of the agents thereto. Such modules are formed by a computer program and are generally known. Since the personal agent is capable of adjusting itself to the wishes of the user, the user receives a better service rendered by the personal agents and, in doing so, the amount of communication is reduced, which further decreases the burden on the system.

[0040] In another modification of the embodiment of the invention, the personal service agents are additionally provided with such a self-learning module, so that the service agents, too, achieve the advantages referred to above. In addition, it is possible here to have the personal agent exchange learning information with the service agent in question in order thus to accelerate the learning process.

[0041] In a further modification of the embodiment, it is possible that the self-learning modules of personal agents within an agent environment exchange learning information in order thus to learn from other personal agents. This may take place, e.g., by having the programs which constitute the agents communicate among themselves. For this purpose, the user must expressly give his permission to his personal agent in advance, and in this connection indicate that the agent is permitted to gain contact with agents of third parties and indicate which personal information the agent may liberate to third parties. Furthermore, it is possible to indicate with which agents the agent of the user is permitted to communicate. Through this selective communication, ~~it is prevented that confidential information of the user be~~ is prevented from being inadvertently passed on, as a result of which the trust of the user in the agent will increase. In this connection, the data traffic between the agents is limited to the required amount, so that the system is not unnecessarily burdened. Such an exchange of learning information is also possible within an environment of service agents in the way described above.

[0042] The implementation of the invention in a computer system may take place in various ways; the embodiment referred to in the example must be considered as being non-limitative. The program parts for the implementation of the elements of the invention may be distributed over a computer network, a program part, e.g., being distributed over several computers, or various parts being present in one and the same computer, or several parts of the same program utilising utilizing, e.g., multi-threading.

[0043] In an exemplary embodiment of the invention, a personal agent may be formed for a new user at the first instance of use of the personal agent system. This may be effected, e.g., by making a copy of a generic personal agent program, and then ~~personalising said~~ personalizing the copy by, e.g., adding personal data of the user to the program. In the same way, the user may initiate the personal service agents desired by him. The agent with associated agents created in this manner may then, e.g., be added to the central control unit and thereby be ratified.